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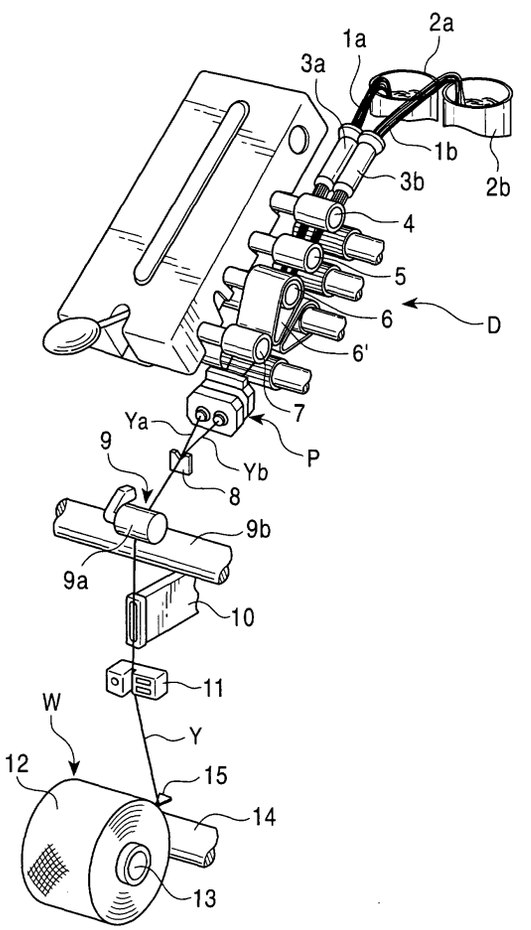
(54) Spinning device

(57) The present invention refers to a spinning device, having a drafting device D which drafts a fiber bundle, a spinning member P positioned in the downstream side of the drafting device D and a winding part W which winds a spun yarn Y produced by the spinning member P, wherein the spinning member P is formed by arranging a plurality of the yarn producing units having a hollow guide shaft 28, a yam passage 32 formed in the central part along the axis of the guide shaft 28 and an air jet nozzle 21 which generates a revolving airflow in a spinning room 20 which is in a tip part 29 of the hollow guide shaft 28; a doubled-yarn guide 8 is provided between the spinning member P and the winding part W; the single yarns Ya and Yb produced by the yarn producing units are united in the doubled-yarn guide 9 and wound to a winding package 12 in the winding part W as doubled yam Y and the single yarns Ya, Yb, do not balloon therefore between the spinning member P and the doubled-yarn guide 8, (Fig. 1).

FIG. 1



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Description

Field of the Invention

[0001] The present invention relates to a spinning device, wherein a plurality of yarns is produced by that a plurality of fiber bundles is supplied to a drafting device and a plurality of the drafted fiber bundles is twisted respectively by the action of revolving airflow, and after that, a doubled yarn is produced by uniting a plurality of yarns.

Background of the Invention

[0002] So far, two revolving airflows whose revolving directions are different are generated in two locations along a transferring direction of fiber bundle respectively by jetting the air from a pair of compressed air jet mouths (the first nozzle, the second nozzle) installed at a prescribed interval, and a yarn-producing unit, such as to produce a fascinated yarn (a yarn that a twining fiber which twines to a parallel fiber is partially existed at an interval to the longitudinal direction) by the revolving airflow generated in these two locations, is installed in parallel, and the spinning device so as to produce the doubled yarn is known, by that two fascinated yarn produced by the yarn producing units installed in parallel are united by passing the doubled-yarn guide. (Laid-open Japanese utility model publication No. Hei-3-23161)

[0003] In the conventional spinning device such that doubled yarn is produced by that two fascinated yarn produced by the yarn producing units installed in parallel are united by passing the doubled-yarn guide, the fascinated yarn is produced by ballooning the fiber bundle and giving the fiber bundle false-twisted by the revolving airflow from the second nozzle that is the downstream-side nozzle of the yarn producing unit. Therefore, the yarn discharged from the yarn producing unit balloons between the yarn producing unit and the doubled-yarn guide, so that two pieces of yarn discharged from the adjacent two yarn producing units respectively interfere with each other and some problems happened such that the yarn breakage is generated and the quality of doubled yarn deteriorates.

[0004] It is an object of the present invention to solve the problem in the above-mentioned conventional spinning device, and that a plurality of the truly twisted-like spun yarns that the twining fiber is existed to the whole of the longitudinal direction is united without using the exclusive doubler winder, and can be wound as the doubled yarn.

Summary of the Invention

[0005] According to the present invention, to achieve the above-mentioned object, in the first invention of the spinning device, having a drafting device which drafts fiber bundles, a spinning member positioned in the downstream-side of the drafting device and the winding part which winds the spun yarn produced by the spinning member, the spinning member is comprised by arranging a plurality of the yarn producing units whose spinning member has the hollow guide shaft that the yarn passage is formed extended to the axis direction and the air jet nozzle that the revolving airflow is generated in the spinning room that is in the tip part of the hollow guide shaft, and the doubled-yarn guide is provided between the spinning member and the winding part, and the single yarns produced by a plurality of the yarn producing units is united in the doubled-yarn guide and is wound to the winding package as the doubled yarn in the winding part.

[0006] According to the first invention, a plurality of the fiber bundles introduced from the drafting device to the spinning member is discharged from the spinning member as a plurality of the spun yarns, and after united in the doubled-yarn guide, the spun yarn is wound to the winding package as a doubled yarn in the winding part. In the yarn producing unit of the spinning member, after the back end of the fiber comprising the fiber bundle is reversed by the revolving airflow acted to the tip part of the hollow guide shaft, it is wound around the tip part of the trailing fiber and is sucked into the yarn passage by running the fiber bundle (the spun yarn). Herewith, the truly twisted-like spun yarn that the twining fiber is existed to the whole of the longitudinal direction is produced respectively in each yarn-producing unit.

[0007] As the spun yarn is produced based on this fundamental, the single yarn discharged from each yarn-producing unit does not balloon between the spinning member and the doubled-yarn guide. Therefore, the problem such that a plurality of single yarns is interlaced, broken or the yarn quality deteriorates by ballooning is not happened, like the conventional spinning device using two revolving airflows that revolve in the reverse directions.

[0008] According to the second invention, each yarn-producing unit has a suction power generating means which generates suction power from the yarn-passage inlet to the yarn discharging outlet of the hollow guide shaft respectively, and in the yarn discharging spinning at the start of spinning, the spun yarn is discharged respectively from each yarn producing unit by operating both the air jet nozzle and the suction power generating means, and a control device, switching to the normal spinning by stopping the operation of the suction power generating means with keeping the operation of the air jet nozzle as the yarn discharging spinning ends, is provided.

[0009] According to the second invention, as the spinning is started from the abeyant state of spinning device, yarn discharging spinning is implemented by operating both the air jet nozzle and the suction-power generating means. By implementing the yarn discharging spinning like this, the fiber bundle supplied from the drafting de-

vice is discharged from the yarn producing unit as the spun yarn in the state of having intensity that can be drawn by the yarn drawing means without being stuck in the yarn producing unit. Accordingly, as the timings of the running initiation to the winding direction of parent yarn and of the transfer restarting of the fiber bundles do not need to be considered like the yarn piecing method (the piecing) that the parent yarn drawn from the winding side is needed to thread adversely to the hollow guide shaft, the restarting of the spinning device that produces the doubled yarn winding package can be surely implemented by the simple composition.

[0010] As the enough delivering power (the power that is pulled to the downstream side) is applied to the spun yarn that passes through the yarn passage of the hollow guide shaft, the operation of the suction-power generating device is stopped with keeping the operation of the air jet nozzle, and the operation is switched to the normal spinning.

[0011] The switching from the yarn discharging spinning to the normal spinning can be implemented smoothly, only by stopping the operation of the suction-power generating means.

[0012] According to the third invention, the suction-power generating means, having the inner air passage formed in the outer side of the yarn passage in the hollow guide shaft and the assistant nozzle connecting the inner air passage and the yarn passage, jets compressed air from the inner air passage into the yarn passage through the assistant nozzle.

[0013] According to the third invention, the composition of the suction-power generating means can be simpler and the powerful suction-power can be generated in the yarn passage of the hollow guide shaft.

[0014] According to the forth invention, the jet pressure of the air jet nozzle can be freely changeable, and the control device keeps the jet pressure of the air jet nozzle low in the prescribed time period from the beginning of the yarn discharging spinning.

[0015] According to the forth invention, during the operation of both the air jet nozzle and the suction-power generating means (the assistant nozzle), the fiber bundle supplied from the drafting device can be prevented from being twirled by the revolving airflow in the tip part of the hollow guide shaft by keeping the jet pressure of the air jet nozzle low in the first prescribed time period, and the fiber bundle can be surely sucked into the yarn passage of the hollow guide shaft by the suction-power of the suction-power generating means (the assistant nozzle). Therefore, the reliability of the yarn discharging spinning is improved.

[0016] According to the fifth invention, the yarn piecing part, the spinning-side yarn end guide means which leads the spinning-side yarn end discharged from the yarn producing unit to the yarn piecing part by the yarn discharging spinning and the winding-side yarn end guide means which leads the winding-side yarn end unwinded from the winding package to the yarn piecing part are provided, and in the yarn piecing operation, the spinning-side yarn end guide means and the winding-side yarn end guide means are operated and the yarn piecing process between the spinning-side yarn end and the winding-side yarn end is implemented in the yarn piecing part, and the spun yarn produced by the yarn discharging spinning is all eliminated and the spun yarn after switching to the normal spinning is pieced in the yarn piecing operation.

[0017] According to the fifth invention, as the spinning-side spun yarn and the winding-side spun yarn after switching to the normal spinning are pieced in the yarn piecing operation, the spun yarn at the yarn discharging spinning is not mixed into the winding package. Accordingly, the quality of the spun yarn of the winding package can be even.

[0018] According to the sixth invention, in the spinning device having the drafting device which drafts the fiber bundle, the spinning member positioned in the downstream side of the drafting device and the winding part which winds the spun yarn produced by the spinning member, the spinning member is comprised by arranging a plurality of the yarn producing units having the hollow guide shaft part and the spinning nozzle part, and the hollow guide shaft part has the hollow guide shaft that the yarn passage extended to the axis direction is formed, and the spinning nozzle part has the air jet nozzle which generates the revolving airflow in the spinning room which is in the tip of the hollow guide shaft, and a plurality of the hollow guide shaft parts and a plurality of the spinning nozzle parts is comprised that they can be freely contacted by the common drive means, and the doubled-yarn guide is provided between the spinning member and the winding part, and the single yarns produced by a plurality of the yarn producing units are united in the doubled-yarn guide, and the yarn is wound to the winding package as the doubled yarn in the winding part.

[0019] According to the sixth invention, a plurality of the fiber bundles introduced from the drafting device to the spinning member is discharged from the spinning member as a plurality of the spun yarns and they are wound to the winding package as the doubled yarn in the winding part after united in the doubled-yarn guide. In the yarn producing unit of the spinning member, after the back end of the fiber composing the fiber bundle is reversed by the revolving airflow acted to the tip part of the hollow guide shaft, it is wound around the tip part of the trailing fiber and is sucked into the yarn passage by running the fiber bundle (the spun yarn). The truly twisted-like spun yarn that the twining fiber is existed to the whole of the longitudinal direction in each yarn producing unit is produced respectively like this.

[0020] As the spun yarn is produced by the fundamental like this, the single yarn discharged from each yarn producing unit does not balloon between the spinning member and the doubled-yarn guide. Therefore, the problems such that the yarn is broken and the yarn qual-

ity is deteriorated as a plurality of single yarns is interlaced by ballooning are not happened like the conventional spinning device using two revolving airflows that rotate to the reverse directions.

[0021] Moreover, the automatic elimination can be surely implemented even in the case that the spinning is implemented in the state that the hollow guide shaft part and the spinning nozzle part are united and the fiber is stuck in the spinning room between the hollow guide shaft part and the spinning nozzle part or the surroundings by separating the hollow guide shaft part and the spinning nozzle part at the yarn breakage (at the halt of spinning). Particularly, as a plurality of the hollow guide shaft parts and a plurality of the spinning nozzle parts are composed as they can be freely contacted by the common drive means, the structure can be simpler and the unite and the separating operation of a plurality of the hollow guide shaft parts and a plurality of the spinning nozzle parts can be surely implemented.

[0022] According to the seventh invention, the shield part shielding the spinning room in each yarn producing unit each other is provided, and in spinning, it is comprised such that the revolving air in each spinning room by the air jet nozzle does not interfere with each other.

[0023] According to the seventh invention, the turbulence of the revolving airflow by the interference is not generated and the yarn discharging spinning and the normal spinning can be implemented in good condition as the revolving airflow in each spinning room by the air jet nozzle does not interfere with each other. Therefore, the success ratio of the yarn discharging spinning can be improved, and the quality deterioration of the spun yarn produced in the normal spinning can be prevented.

[0024] According to the eighth invention, the first arm, having a plurality of inserting holes corresponded to each spinning nozzle part, which a plurality of the spinning nozzle parts are installed and the second arm, comprised of contacting freely to the first arm, that a plurality of the installing blocks is installed are provided, and the hollow guide shaft is installed in a plurality of the installing blocks, and a part of a plurality of the installing blocks installed in the second arm is inserted into a plurality of the inserting holes formed in the first arm respectively and the positioning of the hollow guide shaft to the air jet nozzle is implemented.

[0025] According to the eighth invention, as the positioning is implemented by that the installing block installed the hollow guide shaft is inserted into the inserting hole, the positioning can be implemented correctly to the positional relation when each hollow guide shaft is in the spinning condition to each air jet nozzle in uniting the hollow guide shaft part and the spinning nozzle part by the simple structure.

[0026] According to the ninth invention, as a plurality of the installing blocks is supported through the elastic body in order to freely adjusting the core separately to the second arm and a part of the installing block is inserted into the inserting hole as both arms come close, it is comprised such that the core of each installing block is adjusted separately to each inserting hole and the installing block is pressured to the spinning nozzle part by the energization power of the aforementioned elastic body.

[0027] According to the ninth invention, as the core of each installing block is adjusted separately in uniting the hollow guide shaft part and the spinning nozzle part, each hollow guide shaft can be positioned correctly to each air jet nozzle separately. Moreover, as the installing block is pressured to the spinning nozzle part by the energization power of the elastic body, the air leak between the installing block and the spinning nozzle part (the inserting hole) can be surely prevented, and spinning can be implemented with discharging air from the air jet nozzle to the spinning room in good condition all the time.

Brief Description of the Drawings

[0028]

Figure 1 is a perspective view of a spinning unit comprising the spinning device of the present invention.

Figure 2 is a sectional side elevation of a hollow guide shaft etc. used in the spinning device of the present invention.

Figure 3 is a partially perspective view of a spinning member etc. in the spinning device of the present invention.

Figure 4 is an exploded perspective view of a spinning member etc. in the spinning device of the present invention.

Figure 5 is an exploded perspective view of a spinning member etc. in the spinning device of the present invention, seeing Figure 4 from the opposite side.

Figure 6 is a partially perspective view of the spinning member etc. in the spinning device of the present invention.

Figure 7 is a schematic drawing showing a side view of the spinning unit and the yarn piecing device comprising the spinning device of the present invention.

Figure 8 is a timing chart, showing the operation of the spinning device of the present invention as the spinning is started.

Figure 9 is a partially sectional side elevation of a spinning member etc. in the spinning device of the present invention.

Figure 10 is a partially sectional view of the spinning member etc. in the spinning device of the present invention, as well as Figure 3.

Figure 11 is a partially sectional side elevation of the spinning member in the spinning device of the present invention, as well as Figure 7.

Figure 12 is a side section of the hollow guide shaft

etc. of another embodiment used in the spinning device of the present invention.

Detailed Description of the Preferred Embodiments

[0029] Embodiments of the present invention will be described below, however the present invention is not limited to the following embodiments unless the spirits thereof are deviated from. Moreover, in the following description, the spinning device of the present invention will be described using the example that doubled yarn is manufactured by twining two pieces of yarn, as an example.

[0030] First, the total composition of the spinning device of the present invention will be described as an example, with reference to Figure 1.

[0031] 1a and 1b are fiber bundles (slivers) stored respectively in cans 2a, 2b. 3a and 3b are the cylinder-shaped guides for the fiber bundles position in the inlet of a drafting device D. The drafting device D is an example of the four-line type drafting device comprising a back roller 4, a third roller 5, a second roller 6 added to install an apron belt 6'and a front roller 7. The drafting device D drafts the fiber bundles 1a, 1b using the peripheral-speed difference between rollers. An after-mentioned spinning member P is positioned in just the downstream side of the drafting device D and two pairs of the yarn producing units are built-in. 8 is a doubled yarn guide and 9 is a yarn delivering member comprising a nip roller 9a and a delivery roller 9b. The doubled-yarn guide 8 is positioned between the spinning member P and the yarn delivering member 9. 10 is a slack tube (a yarn storing member) for storing the doubled yarn discharged from the spinning member P that the spinning is restarted temporarily in the piecing operation, and 11 is a yarn clearer (a detector of yarn thickness). 12 is a package wound to a bobbin 13 supported by the bobbin holder (not shown in the drawings), and the package 12 is comprised of rotating by a friction roller 14 abutting against the surface of the package 12. 15 is a traverse guide of the traverse device (not shown in the drawings). Moreover, a winding part W is comprised of the bobbin 13 supported by the bobbin holder, the friction roller 14 and the traverse guide 15 etc..

[0032] After the fiber bundles 1a, 1b pulled respectively extruded from the cans 2a, 2b are drafted by the common drafting device D, they are entered into two pairs of the yarn producing units comprising the spinning member P and two pieces of yarn Ya, Yb are produced by the respective yarn producing unit, and after that, the produced two pieces of yarn Ya, Yb become the doubled yarn Y, united by the doubled-yarn guide 8. After that, the doubled yarn Y is nipped by the nip roller 9a and the delivery roller 9b and is transferred to the winding part W direction. Moreover, in the winding part W, it is comprised such that the doubled yarn Y is wound to the package 12 that rotates by being abut against the friction roller 14 while traversed by the traverse guide 15. Moreover, hereafter the yarn Ya, Yb are called the single yarns Ya, Yb, for clearly discriminating two pieces of yarn Ya, Yb produced respectively and the doubled yarn Y formed by uniting these yarn Ya, Yb by two pairs of the yarn producing units.

[0033] The spinning device is formed by installing the numerous spinning units in parallel comprising the drafting device D, the spinning member P, the yarn delivering member 9, the slack tube 10, the yarn clearer 11 and the winding part W etc. as mentioned above.

[0034] Next, the spinning member P that two pairs of yarn producing units Ua, Ub are built-in will be described with reference to Figure 2 ~ Figure 6 mainly. Moreover, one yarn-producing unit U will be described as the two pairs of the yarn producing units Ua, Ub have the same composition basically. Moreover, regarding the reference marks in the drawings, the same Arabic numerals are used to the common composition member, and according to the request, a lower-case alphabet (a) is attached to the Arabic numerals to one yarn producing unit Ua, and to the other yarn producing unit Ub, a lower-case alphabet (b) is attached to the Arabic numerals, but regarding the description of the common composition like Figure 2, the composition member etc. will be described only using the Arabic numerals without attaching the alphabet (a) or (b).

[0035] The yarn producing unit U is mainly comprised of a spinning nozzle part N fixed in the after-mentioned first swinging arm and a hollow guide shaft part S which can be united or separated to the spinning nozzle part N.

[0036] The spinning nozzle part N has a needle holder 18, comprising a guide hole 16 that the drafted fiber bundle 1 by the drafting device D is introduced and a needle 17 installed on the passage of the fiber bundle 1 discharged from the guide hole 16, and the needle holder 18 is installed in a nozzle block 19. The nozzle block 19 formed in the abbreviated cylindrical shape has a spinning room 20 in it, and has a plurality of air jet nozzles 21 for generating the revolving airflow in the spinning room 20. The air jet nozzle 21 is open towards the tangent direction, to the spinning room 20 whose cross section is formed circular. The tip part of the needle holder 18 is inserted into an opening 22' of a housing 22, and the nozzle block 19 positioned in the housing 22 is installed by inserting into an opening 24' formed in a first swinging arm 24 through an intermediate board 23 having an opening 23' that the nozzle block 19 can be freely inserted. 25 is an air reservoir formed in the housing 22 such as to surround the compressed-air introduction hole of the air jet nozzle 21, and the reservoir 25 is communicated to a compressed-air passage 26 and a shell 27 that the compressed-air passage 26 is formed is connected to the compressed-air supply source (not shown in the drawings). A solenoid valve for switching the jet/halt of the compressed air from thenozzle 21 is provided between the air jet nozzle 21 and the compressed air supply source, and the solenoid valve is switched by the switching signal from the after-mentioned control de-

vice.

[0037] The compressed air supplied to the air reservoir 25 through the compressed-air passage 26 and the like is jet from the air jet nozzle 21 to the tip part 29 direction of the after-mentioned hollow guide shaft 28, and the revolving air is generated in the spinning room 20 and the airflow to the spinning room 20 direction is generated in the guide hole 16 of the needle holder 18, and the suction airflow is generated in the vicinity of the fiber bundle introduction hole positioned in the front roller 7 side of the guide hole 16. By this suction airflow, the fiber bundle 1 coming from the front roller 7 becomes easier to introduce to the guide hole 16 of the needle holder 18.

[0038] A hollow guide shaft 28 comprising the hollow guide shaft part S has a frustum-cone shape tip part 29 and a barrel part 31 having a circular-shaped inner air passage 30, and a yarn passage 32 is formed in the central part along the axis of the hollow guide shaft 28. The inner air passage 30 and a yarn passage 32 is connected by an assistant nozzle 33, and a pipe 36 connected to the compressed air supply source (not shown in the drawings) is also connected to the inner air passage 30 through a connection tool 35 connected to an eyehole 34 formed in the barrel part 31. Moreover, the assistance nozzle 33 is comprised such as to be positioned in the tip part 29 side, compared with the eyehole 34 formed in the barrel part 31.

[0039] It is comprised such that the compressed air jetted from the assistant nozzle 33 is entered to the yarn passage 32 formed in the hollow guide shaft 28 and flows to a yarn discharging outlet 28' direction positioned in the opposite side of the tip part 29 of the hollow guide shaft 28.

[0040] 37 is a shaft installing block that the hollow guide shaft 28 is installed, and the shaft installing block 37 has a base part 38 whose shape is that a part of the disc is eliminated along by the string, a frustum cone 39 positioned in the center of the base part 38, a cylinder part 40 positioned in the center of the base part 38 to the frustum cone 39 and a leg part 42 that is installed in the base part 38 of the cylinder part 40 side in a protrusion manner and a screw hole 41 is formed, and it is comprised such that the hollow guide shaft 28 is attached by inserting to an eyehole 43 formed along the axis of the shaft installing block 37 and the tip part 29 of the hollow guide shaft 28 is protruded over the frustum cone part 39.

[0041] 44 is a second swinging arm, and two installing holes 46 that the cylinder part 40 of the shaft installing block 37 can be freely attached by inserting is provided in parallel in an installing pedestal part 45 of the second swinging arm 44. Moreover, a leg part attachment hole 47 attached by inserting the leg part 42 formed in the shaft installing block 37 is made around two installing holes 46 formed in the installing pedestal part 45. In an embodiment of the present invention, as it is comprised such that three leg parts 42 is formed to one shaft installing block 37 and two shaft installing blocks 37 is attached to the pedestal part 45, the example that six leg part attachment holes 47 is made in the installing pedestal part 45 is showed. A space part 49 whose inside diameter is larger than the one of the leg part attachment part 47 is formed in the part that the leg part 42 of the leg part attachment hole 47 formed in the pedestal part 45 is positioned in the opposite side of the attachment side, in order that a head part 48' of a bolt 48 can be inserted. Moreover, a ring-shape convex part 50 is installed in a protrusion manner in the inner surface of the leg part attachment hole 47 adjacent to the border between the leg part attachment hole 47 and the space part 49. The inner diameter of the space part 49 can be same as the inner diameter of the leg part attachment hole 47 or can be smaller depending on the sizeof the head part 48' of the bolt 48, and the above-mentioned ring-shape convex part 50 formed for the after-mentioned object can be abbreviated as the step partis formed in the border between the leg part attachment hole 47 and the space part 49 in case that the inner diameter of the space part 49 becomes smaller that the one of the leg part attachment hole 47.

[0042] Next, the installing means that the shaft installing block 37 that the hollow guide shaft 28 is installed to the installing pedestal part 45 of the second swinging arm 44 is installed will be described.

[0043] The cylinder part 40 of the shaft installing block 37 that the hollow guide shaft 28 is installed is attached by inserting to the installing hole 46 formed in the installing pedestal part 45 of the second swinging arm 44, and a coil spring 51 is inserted in advance. The leg part 42 formed in the shaft installing block 37 is attached by inserting to the leg part attachment hole 47 formed in the installing pedestal part 45. It is comprised that the edge part of the space part 49 side of the coil spring 51 inserted into the leg part attachment hole 47 is abut against the ring-shape convex part 50 which is installed in a protrusion manner in the inner surface of the leg part attachment hole 47. Next, the shaft installing block 37 that the hollow guide shaft 28 is attached is installed in the installing pedestal part 45 of the second swinging arm 44 by that the bolt 48 is inserted from the space part 49 side formed in the installing pedestal part 45 of the second swinging arm 44 into the inside of the coil spring 51 inserted into the leg part attachment hole 47 and the tip part of the bolt 48 is screwed into the screw hole 41 of the leg part 42 formed in the shaft installing block 37. Two shaft installing blocks are comprised to be attached to the installing pedestal part 45 of the second swinging arm 44 in an embodiment of the present invention, however, two shaft installing blocks 37 are positioned such that straight line parts 38a', 38b' formed in the edge part of the base part 38 of the shaft installing block 37 become relative to a parallel state.

[0044] As the shaft installing block 37 attached the hollow guide shaft 28 is installed to the installing pedestal part 45 of the second swinging arm 44, the leg part 42 of the shaft installing block 37 is attached by insertion

to the leg part attachment hole 47 formed in the installing pedestal part 45, and the edge part of the space part 49 of the coil spring 51 inserted into the leg part attachment hole 47 is abut against the ring-shape convex part 50 installed in a protrusion manner in the inner surface of the leg part attachment hole 47. Moreover, another edge part of the coil spring 51 is comprised of abutting against the bottom surface of the leg part 42, so that the shaft installing block 37 is energized to the direction that the leg part 42 is exited from the leg part attachment hole 47 formed in the installing pedestal part 45 by the energization power of the coil spring 51. Moreover, the head part 48' of the bolt 48 is comprised of being abut against the step part 52 formed in the border between the leg part attachment hole 47 and the space part 49 before the leg part 42 of the shaft installing block 37 is exited from the leg part attachment hole 47 formed in the installing pedestal part 45, in order that the leg part 42 of the shaft installing block 37 is not fully exited from the leg attachment hole 47 formed in the installing pedestal part 45.

[0045] An opening 22' that the above-mentioned needle holder 18 can be inserted is formed in the housing 22 attached in the tip part of the above-mentioned first swinging arm 24, and in an embodiment of the present invention, as the spinning device having two pairs of the yarn producing units Ua, Ub is shown, two openings 22' are formed in a horizontal relation such that two needle holders 18 can be inserted. Moreover, two inserting holes 53 are formed in the tip part of the first swinging arm 24 corresponding to the two openings 22' formed in the housing 22. The inserting hole 53 is comprised such that the frustum cone part 39 of the shaft installing block 37 that the hollow guide shaft 28 positioned in the installing pedestal part 45 of the second swinging arm 44 is attached is inserted.

[0046] As shown in Figure 6 etc., a cavity part 55 having an opening 54 in the down end of the tip part of the first swinging arm 24 is formed along the longitudinal direction in the first swinging arm 24, and the cavity part 55 are separated into two along the way and one branch passage 56 is connected to one inserting hole 53 in the two inserting holes 53 formed in the tip part of the first swinging arm 24, and the other branch passage 56 is connected to the other inserting hole 53 in the two inserting holes 53 formed in the tip part of the first swinging arm 24. Moreover, the opening 54 formed in the down side of the tip part of the first swinging arm 24 is connected to a pipe 57 connected to the air suction source (not shown in the drawings). As mentioned later, in the spinning state that the spinning nozzle part N and the hollow guide shaft part S are united and the yarn producing units Ua, Ub built-in the spinning member P produce the single yarns Ya, Yb respectively, the floating fiber and the dust in spinning is comprised of being sucked and eliminated by generating the weak suction airflow in the inserting hole 53 through the pipe 57 and the branch passage 56, and of functioning as the escape of the compressed air which is jetted from the air jet nozzle 21 of the nozzle block 19.

[0047] Next, the means etc. that swings the first swinging arm 24 and the second swinging arm 44 will be described.

[0048] A horizontal shaft 59 installed in a suitable machine body F of the spinning device is inserted into a horizontal-axis hole 58 formed in the down end part of the second swinging arm 44, and a piston rod 61 of a cylinder 60 installed in the suitable machine body F of the spinning device is pivoted in a branch arm 44' of the second swinging arm 44, so that it is comprised such that the operation of the cylinder 60 can make the piston rod 61 move back and forward. The first swinging arm 24 and the second swinging arm 44 can be swung by the cylinder 60 that is a common drive source, and by the swing of the first swinging arm 24 and the second swinging arm 44, the spinning nozzle part N and the hollow guide shaft 28 can be moved respectively between the spinning position and the evacuating position. By operating the cylinder 60 from the spinning state (the merger state) that the first swinging arm 24 and the second swinging arm 44 are in the spinning position, the first swinging arm 24 and the second swinging arm 44 are swinging together to the halfway, and the swing of the first swinging arm 24 is controlled by the stopper (not shown in the drawings) attached in the suitable position of the machine body F at the prescribed position, and after that, only the second swinging arm 44 is swung to the evacuation position. As the first swinging arm 24 and the second swinging arm 44 are swung to the evacuation position like this, the prescribed space will be formed both between the drafting device D and the spinning nozzle part N, and between the spinning nozzle part N and the hollow guide shaft part S.

[0049] When the piston rod 61 is advanced in from the state that the first swinging arm 24 and the second swinging arm 44 are in the back position, the first swinging arm 24 and the second swinging arm 44 swing towards the front roller 7, and finally, it is comprised that the frustum cone part 39 of the shaft installing block 37 positioned in the installing pedestal part 45 of the second swinging arm 44 is inserted into the inserting hole 53 formed in the tip part of the first swinging arm 24, and a flat aspect 24" of the tip part of the first swinging arm 24 and the base part 38 of the shaft installing block 37 installed in the second swinging arm 44 are met face to face. When the flat aspect 24" of the tip part of the first swinging arm 24 and the base part 38 of the shaft installing block 37 installed in the second swinging arm 44 are met face to face, the base part 38 of the shaft installing block 37 installed in the second swinging arm 44 is comprised to pressure to the flat aspect 24" of the tip part of the first swinging arm 24 by the energization power of the coil spring 51 inserted in the leg part attachment hole 47 formed in the installing pedestal part 45. Moreover, when the piston rod 61 is retreated, the spinning nozzle part N positioned in the first swingin-

garm 24 and the hollow guide shaft part S positioned in the second swinging arm 44 are comprised to be separate finally.

[0050] Moreover, as the frustum cone part 39 of the shaft installing block 37 positioned in the installing pedestal part 45 of the second swinging arm 44 is inserted into the inserting hole 53 formed in the tip part of the first swinging arm 24, and the spinning nozzle part N positioned in the first swinging arm 24 and the hollow guide shaft part S positioned in the second swinging arm 44 are united, the tip part 29 of the hollow guide shaft 28 comprising the hollow guide shaft part S is comprised to position. In other words, as the spinning nozzle part N and the hollow guide shaft part S are united, the hollow guide shaft 28 is positioned in the prescribed position to the air jet nozzle 21 and the needle 17.

[0051] The first swinging arm 24, that bifurcates from the tip part, has two diverging arms 62, and the horizontal shaft 59 positioned in the suitable machine body F of the above-mentioned spinning device is inserted and installed in a horizontal shaft hole 62' made in the diverging arm 62. Moreover, according to the first swinging arm 24, it is positioned in the down part of the front roller 7 of the drafting device D and the needle holder 18 and a suction mouse 63 having the opening in the upper part is installed, and the suction mouse 63 is connected to an air suction source (not shown in the drawings) through a pipe 64 connected to the suction mouse63. The suction mouse 63 has the function that the floating fiber and the dust in this vicinity are sucked in and eliminated.

[0052] Next, the producing process of yarn in the yarn producing unit U having the composition mentioned above will be described. Moreover, the fiber bundle 1 pulled and drafted from one cans 2 in the cans 2a, 2b will be described.

[0053] The spinning that is the yarn producing process is implemented in the state that the spinning nozzle part N and the hollow guide shaft part S are in the spinning position respectively, however in this state, the frustum cone part 39 of the shaft installing block 37 is inserted into the inserting hole 53 formed in the first swinging arm 24. The spinning nozzle part N and the hollow guide shaft part S are united in the yarn producing process like this, and after the fiber bundles 1 supplied to the drafting device D pulled out from the cans 2 is drafted by the drafting device D respectively, the fiber bundle 1 is entered into the guide hole 16 by the suction airflow in the vicinity of the guide hole 16 of the needle holder 18 generated in the action of the jet air jetted from the air jet nozzle 21, and after that, it is transferred along the surrounding area of the needle 17 and entered into the spinning room 20.

[0054] The fiber that comprising the fiber bundle 1 sucked into the spinning room 20 is affected by the action of the revolving airflow which revolves in high speed in the vicinity of the tip part 29 of the hollow guide shaft 28 jetted from the air jet nozzle 21, and the back end is reversed to the downstream side while diverging from the fiber bundle 1 and is twisted to the direction of the revolving airflow. In other words, as the back end part of the fiber which comprises the fiber bundle 1 is twined around the tip part 29 of the hollow guide shaft 28 in the state that it is reversed to the downstream side and it is sucked into the yarn passage 32 of the hollow guide shaft 28 by the action of the revolving airflow, the truly twisted-like spun yarn that the twining fiber is existed throughout to the longitudinal direction is produced by twining around the fiber bundle 1 which is in the center part sequentially. A part of the twist by the revolving airflow in spinning is going to be transmitted to the front roller 7 direction, however, the transmission is prevented by the needle 17 and the fiber bundle 1 introduced form the front roller 7 is not twisted by the above-mentioned twist. The above-mentioned twisted fiber is produced into the truly twisted-like single yarns Ya, Yb major part of which becomes the twined fiber sequentially, and it is passed through the yarn passage 32 of the hollow guide shaft 28 and is discharged from the yarn discharging outlet 28'. In the normal yarn producing process of single yarns Ya, Yb, the compressed air passes through the pipe 36 and the connecting tool 35 from the compressed air supply source but is not supplied to theinner air passage 30 of the hollow guide shaft 28, so that the compressed air is not supplied into the yarn passage 32 from the assistant nozzle 33.

[0055] As two pairs of yarn producing units Ua, Ub are built in the spinning member P, two pieces of single yarns Ya, Yb are produced by the yarn producing process mentioned above. The single yarns Ya, Yb produced by the respective yarn producing units Ua, Ub are united by passing the doubled-yarn guide 8 and formed into the doubled yarn Y, and after that, it is nipped by the nip roller 9a and the delivery roller 9b comprised the yarn delivering member 9 and transferred to the package 12 direction, and after that, it is wound to the package 12 which rotates by being abut against the friction roller 14.

[0056] Next, the starting of the spinning device and the restarting operation of spinning after the yarn breakage is generated will be described.

[0057] Before the starting of the spinning device or in generating the yarn breakage, a part of the draft roller is stopped and the compressed air is not jetted from the air jet nozzle 21 and the assistant nozzle 33, so that the air jet nozzle 21 and the assistant nozzle 33 is not in the operating condition. The fiber bundle 1 whose tip is gripped by the third roller 5 in the stopping condition is delivered by the rotating drive of the back roller 4 and the third roller 5, and is supplied to the yarn producing unit U of the spinning member P through the second roller 6 and the front roller 7. Along with starting the drive of the draft roller in the stopping condition, the compressed air is jetted from the air jet nozzle 21 and the assistant nozzle 33. In other words, at the restart of the spinning generated before implementing the yarn piecing operation, in the yarn producing unit U, the com-

pressed air is jetted from the air jet nozzle 21 and the compressed air is supplied from the compressed air supply source to the inner air passage 30 of the hollow guide shaft 28 through the pipe 36 and the connecting tool 35, so that compressed air is also jetted from the assistant nozzle 33 into the yarn passage 32.

[0058] As the air jet nozzle 21 is formed slanting to the downstream side of the delivering direction of the fiber bundle 1 and the compressed air jetted from the air jet nozzle 21 is flowed to the delivering direction of the fiber bundle 1 with revolving, the fiber bundle 1 introduced to the guide hole 16 of the needle holder 18 is delivered to the vicinity of a yarn passage inlet 28" formed in the tip of the hollow guide shaft 28 through the needle 17 with making the fiber false twisted loosely by the revolving airflow.

[0059] Moreover, the compressed air jetted from the assistant nozzle 33 is flowed along the surface of the internal circumference in the yarn passage 32 formed in the hollow guide shaft 28, and the airflow to the suction direction (the direction into the hollow guide shaft 28) is generated in the yarn passage inlet 28" formed in the tip of the hollow guide shaft 28 with forming the revolving airflow. Therefore, the fiber bundle 1 can be drawn to the yarn passage 32 of the hollow guide shaft 28 successively.

[0060] As mentioned above, the false twisted fiber bundle 1 delivered to the vicinity of the yarn passage inlet 28" formed in the tip of the hollow guide shaft 28 is sucked from the yarn passage inlet 28" into the yarn passage 32 by the suction airflow from the yarn passage inlet 28". Moreover, the fiber bundle 1 is exposed to the revolving airflow generated by the compressed air jetted from the assistant nozzle 33 in the yarn passage 32. By the revolving airflow generated in the spinning room 20 by the compressedair jetted from the air jet nozzle 21 and the revolving airflow (the reverse direction to the revolving airflow by the air jet nozzle 21) generated in the yarn passage 32 of the hollow guide shaft 28 by the compressed air jetted from the assistant nozzle 33, the loosely false twisted fiber bundle 1 is pieced to the yarn in the facinated state and is discharged from the yarn discharging outlet 28' of the hollow guide shaft 28. The yarn spinning condition of the yarn in the facinated state (the fascinated yarn) by the air jet nozzle 21 and the assistant nozzle 33 like this is called a yarn discharging spinning.

[0061] Next, the total composition including a yarn piecing device 80 and the yarn piecing operation by the yarn piecing device 80 will be described in more detail, with reference to Figure 7.

[0062] The machine body of the spinning device is comprised by setting a plurality of the spinning units mentioned above side by side, and the yarn piecing device 80 is disposed along the direction of setting the spinning units side by side in the state that the device can freely run. When the yarn breakage is generated in a spinning unit, the yarn piecing device 80 is run to the yarn breakage generating unit by receiving the yarn piecing request, and the yarn piecing of the spinning-side doubled yarn Y and the winding-side doubled yarn Y is implemented.

[0063] The yarn piecing device 80 comprises a yarn piecing part 81 pieced the introduced spinning-side doubled yarn Y and winding-side doubled yarn Y, a spinning-side yarn end guide member 82 grasping the doubled yarn Y discharged from the spinning member P and introduced to the yarn piecing part 81 and a winding-side yarn end guide member 84 grasping the doubled yarn Y delivered by reversing the winding package 12 and introduced to the yarn piecing part 81.

[0064] For example, an air-type device (the air splicer) that both yarn ends are spliced by the revolving airflow or a device (the mechanical-type knotter) that both yarn ends are knotted and pieced by the rotation of the knotter head can be used in the yarn piecing part 81. The spinning-side yarn end guide member 82, that the suction pipe which can freely revolve upwards and downwards is used, grasps a plurality of the yarns Ya, Yb discharged from the spinning member P in the state of revolving to the yarn grasping position in the upper part, and the yarn Ya, Yb can be introduced to the yarn piecing part 81 by revolving to the lower-yarn guide position in the state. In an embodiment of the present invention, a plurality of the yarns Ya, Yb discharged from a plurality of the yarn producing units is grasped and guided respectively at the same time by one suction pipe comprising the spinning-side yarn end guide member 82. That is to say that the suction pipe comprising the spinning-side yarn end guide member 82, equipped with a suction hole 83 whose size is as big as covering the yarn discharging outlets 28', 28' of a plurality of the yarn producing units at the same time, can graspa plurality of the yarns Ya, Yb discharged from the spinning member P by a common suction hole 83 in the state of being in the yarn grasping position.

[0065] By the composition mentioned above, the yarn piecing movement is implemented by that the yarn piecing device 80 runs to the yarn breakage-generating unit as the yarn breakage is generated in a spinning unit. According to the yarn piecing movement, the spinning-side yarn end guide member 82 revolves to the yarn grasping position that the suction hole 83 is opposed to the yarn discharging outlets 28', 28' of the spinning member P, and in the state, the yarn discharging spinning is implemented and the spun yarn Ya and Yb discharged from the spinning member P by the yarn discharging spinning is sucked and grasped to the spinning-side yarn end guide member 82.

[0066] The yarn discharging spinning will be described in more detail with reference to Figure 8. Moreover, the yarn delivering spinning described later controls the movement of the air jet nozzle 21, the assistant nozzle 33 and the back roller 4 (the third roller 5) by the control device (not shown in the drawings). According to the yarn discharging spinning, first in a time T0, the

supply of the fiber bundle 1 (1a, 1b) is started by redriving the halt draft roller (the back roller 4, the third roller 5), and the air jet nozzle 21 and the assistant nozzle 33 of each yarn producing unit are activated and the twining spun yarns Ya, Yb are produced from the fiber bundle 1 (1a, 1b) using two revolving airflows which revolve to the reverse direction. By working the hollow guide shaft 28 and the both nozzle 21, 33 cooperatively, the spun yarns Ya, Yb which have the intensity of being able to be drawn by the revolution to the downward of the spinning-side yarn end guide member 82. Moreover, the yarn discharging spinning like this is implemented respectively at the same time by each yarn producing unit of the spinning member P.

[0067] The jet pressure of the air jet nozzle 21 keeps low pressure PL in a prescribed time ΔT from the start (the time T0) of the yarn descharging spinning, and after the prescribed time ΔT is passed, the jet pressure of the air jet nozzle 21 is switched to high pressure PH at a time T1. By making the pressure of the air jet nozzle 21 low just after starting the yarn discharging spinning, the whirl of the fiber bundle 1 by the revolving airflow is controlled and the fiber bundle 1 supplied from the guide hole 16 can be surely taken into the yarn passage 32 of the hollow guide shaft 28. That is why the success ratio of the yarn discharging spinning can be improved.

[0068] According to the yarn discharging spinning, as the spinning-side yarn end guide member 82 revolves to the lower yarn guide position in the state of sucking and grasping the yarns Ya, Yb discharged from each yarn producing unit, the respective yarns Ya, Yb, which pass through the doubled-yarn guide 8 and become the doubled yarn Y, is nipped between the rollers 9a, 9b of the yarn delivering member 9 at a time T2 and is introduced to the yarn piecing part 81. At the timing (the time T3) after the delivering power by the yarn delivering member 9 works to the respective yarns Ya, Yb (after the stable delivering of the doubled yarn Y is started), the control device (not shown in the drawings) stops the work of only the assistant nozzle 33 out of the nozzles 21, 33, and switches to the normal spinning that the hollow guide shaft 28 and the air jet nozzle 21 are used. The switching from the yarn discharging spinning to the normal spinning can be implemented smoothly by switching from the yarn discharging spinning to the normal spinning after starting the stable delivery of the doubled yarn Y by the yarn delivering member 9 and by switching only to stop the work of the assistant nozzle 33 with working the air jet nozzle 21 continuously.

[0069] Moreover, in parallel with the introduction of the doubled yarn Y to the yarn piecing part 81 by the spinning-side yarn end guide member 82 like this, the winding-side yarn end (the doubled yarn Y) which is already winded to the winding package 12 by the winding-side yarn end guide member 84 is also introduced to the yarn piecing part 81. As both yarn ends of the spinning and winding sides are introduced to the yarn piecing part 81, the piecing that both doubled yarns Y are connected is implemented by driving the yarn piecing part 81. Moreover, the doubled yarn Y that is spun from the spinning member P during the yarn piecing process in the yarn piecing part 81 is stored in the yarn storing member (the slack tube 10) which is in the downstream side of the yarn delivering member 9.

[0070] According to the yarn piecing movement like this, the twining spun yarn produced by the yarn discharging spinning is all sucked into the spinning-side yarn end guide member 82 and eliminated, and the truly twisted-like spun yarn (the doubled yarn Y) produced after switching to the normal spinning is pieced to the winding-side yarn end (the doubled yarn Y) in the yarn piecing part 81. Therefore, only the doubled yarn Y that the truly twisted-like spun yarns Ya, Yb produced by the normal spinning are united can be winded in the winding package 12.

[0071] In an embodiment of the present invention, the spinning-side fiber bundle 1 can be easily drawn into the hollow guide shaft 28 in the yarn piecing operation as the means to generate the airflow to the suction direction (the direction into the hollow guide shaft 28) is provided in the yarn passage inlet 28" formed in the tip of the hollow guide shaft 28 in the yarn piecing operation at the yarn breakage or at the start of spinning in order that the fiber bundle 1 revolved in the spinning room 20 is sucked and introduced into the yarn passage 32 of the hollow guide shaft 28, and the sure and speedy yarn piecing operation can be implemented as the fascinated yarn which has the intensity that can be drawn by the spinning-side yarn end guide member can be charged from the yarn discharging outlet 28' of the hollow guide shaft 28. Moreover, the assistant nozzle 33 generated the revolving airflow in the yarn passage 32 is provided as the means to generate the airflow to the direction into the hollow guide shaft 28, however, this is not alwaysconfined to the thing to generate the revolving airflow and the things to generate the direct airflow from the yarn passage inlet 28" to the yarn discharging outlet 28' can be also used.

[0072] Moreover, in the yarn piecing operation, the following piecing method is publicly known such that the yarn wound from the separately prepared package or the winding package (hereafter it is called the parent yarn) is passed reversely from the yarn discharging outlet 28' of the hollow guide shaft 28 to the yarn passage 34 of the hollow guide shaft 30 and after that, the fiber bundle 1 and the parent yarn are pieced by that the supply of the fiber bundle into the spinning room 20 is restarted by restarting the drive of the halt third roller 5 and the parent yarn is taken into the package direction, however in this method, piecing is going to fail as the timing that the parent yarn is taken into the package direction, particularly the timing with the drive of the halt third roller 5 grasping the fiber bundle 1 is different. However, in the yarn producing method using the yarn discharging spinning of the air jet nozzle 21 and the assistant nozzle 33 mentioned above, the start and restarting

of the easy and sure spinning device can be implemented as there is no need to consider the timing like the timing of receiving the parent yarn or the timing of restarting the transfer of the fiber bundle as in the yarn piecing method using the parent yarn.

[0073] Next, the combination and separation means of the spinning part N and the hollow guide shaft part S will be described with reference to Figure 9 ~ Figure 11 etc..

[0074] In case of discovering the defects that the width of the yarn is thicker or thinner than the prescribed one in the doubled yarn Y by the yarn clearer 11, the doubled yarn Y is cut by the cutter built-in the yarn clearer 11 and the above mentioned spinning restarting operation will be implemented after the hollow guide shaft part S and the spinning nozzle part N are separated once as mentioned below. In separating the hollow guide shaft part S and the spinning nozzle part N, as mentioned above, the first swinging arm 24 and the second swinging arm 44 are swung centering the horizontal shaft 59 when the cylinder 60 works from the spinning state that both the hollow guide shaft part S and the spinning nozzle part N are united and the piston rod 61 is retreated, and after that the swing of the first swinging arm 24 is regulated by the stopper as mentioned above, and after that only the second swinging arm 44 is swung to the escape position and the hollow guide shaft part S installed in the second swinging arm 44 is separated from the spinning nozzle part N.

[0075] As mentioned above, the fluff and the like attached in the vicinity can be surely eliminated by jetting the compressed air (the air shower) to the vicinity of the fiber bundle introducing inlet of the guide hole 16 of the spinning nozzle part N in the state that the spinning nozzle part N and the hollow guide shaft part S are separated (the state that the spinning nozzle part N is separated from the front roller 7).

[0076] In uniting the spinning nozzle part N and the hollow guide shaft part S which are in the separate condition, as the cylinder 60 is worked and the piston rod 61 is advanced, the second swinging arm 44 rotates to the first swinging arm 24 direction, centering the horizontal shaft 59 and the hollow guide shaft part S installed in the second swinging arm 44 is united to the spinning nozzle part N. Moreover, in an embodiment of the present invention, a coil spring 67 is installed between a short shaft 65 installed in the diverging arm 44' of the second nozzle swinging arm 44 and a pin 66 installed in the first swinging arm 24, and the second swinging arm 44 is comprised to be always energized to the first swinging arm 24 direction by the energization power of the coil spring 67. Accordingly, after the spinning nozzle part N and the hollow guide shaft part S are united, the unite state of the spinning nozzle part N and the hollow guide shaft part S is surely maintained even if the supply of the fluid like the air to the cylinder 60 is stopped.

[0077] In the unite operation of the spinning nozzle part N and the hollow guide shaft part S mentioned above, the frustum cone part 39 of the shaft installing block 37 installed in the installing pedestal part 45 of the second swinging arm 44 is comprised to be inserted into the inserting hole 53 formed in the tip of the first swinging arm 24, and the flat side surface 24" in the second swinging arm 44 side of the tip part of the first swinging arm 24 and a side surface 38" in the first swinging arm 24 side of the base part 38 of the shaft installing block 37 installed in the installing pedestal part 45 of the second swinging arm 44 are comprised to contact face to face. Moreover, in the final step of the rotating operation of the second swinging arm 44 to the first swinging arm 24 direction, the side surface 38" in the first swinging arm 24 side of the base part 38 of the shaft installing block 37 installed in the installing pedestal part 45 of the second swinging arm 44 is abut against the flat side surface 24" in the second swinging arm 44 side of the tip part of the first swinging arm 24, but furthermore, asthe second swinging arm 44 rotates to the first swinging arm 24 direction, the leg part 42 of the shaft installing block 37 is entered into the leg part attachment hole 47, and is compressed the coil spring 51 against the energization power of the coil spring 51 stored in the leg part attachment hole 47 of the installing pedestal part 45 of the second swinging arm 44, therefore, the shaft installing block 37 installed in the second swinging arm 44 is pressed to the tip part of the first swinging arm 24 by the repulsion power of the coil spring 51. Accordingly, the flat side surface 24" in the second swinging arm 44 side of the tip part of the first swinging arm 24 and the side surface 38" in the first swinging arm 24 side of the base part 38 of the shaftinstalling block 37 installed in the installing pedestal part 45 of the second swinging arm 44 are contacted face to face in the pressed condition, and the generation like the air leakage can be prevented without forming the gap between the aforementioned side surfaces 24", 38".

[0078] In an embodiment shown in Figure 12, wherein the inner air passage 30 and the assistant nozzle 33 etc. are eliminated from the above-mentioned hollow guide shaft 28, the yarn producing method is same in the normal spinning condition, but the yarn discharging spinning cannot be implemented as the assistant nozzle 33 is not formed. Therefore, the above-mentioned yarn piecing using parent yarn is needed in the yarn piecing operation when generating the yarn breakage. In other words, yarn piecing is implemented by that parent yarn is passed reversely from the yarn discharging outlet 28' of the hollow guide shaft 28 to the yarn passage 32 of the hollow guide shaft 28 and after that, the drive of the halt third roller 5 is restarted and the supply of the fiber bundle into the spinning room 20 is restarted and the parent yarn is drawn to the package direction.

[0079] As mentioned above, as the yarn producing unit comprising the spinning nozzle part N equipped with the nozzle block 19 having the air jet nozzle 21 generating the revolving airflow and the hollow guide shaft

part S equipped with the hollow guide shaft 28 are utilized as two pairs of the yarn producing units Ua, Ub built-in the spinning member P, the produced single yarns Ya, Yb do not ballooned between the yarn discharging outlet 28' of the hollow guide shaft part S and the doubled-yarn guide 8, so that the troubles like the yarn breakage by the ballooning in the above-mentioned conventional doubled yarn spinning device are not generated and the quality of the doubled yarn is not deteriorated.

[0080] Moreover, in the unite operation of the spinning nozzle part N and the hollow guide shaft part S, as the frustum cone part 39 of the shaft installing block 37 installed in the installing pedestal part 45 of the second swinging arm 44 is comprised to be inserted into the inserting hole 53 formed in the tip part of the first swinging arm 24, the core adjustment of the hollow guide shaft 28 installed in the hollow guide shaft part S and the nozzle block 19 installed in the spinning nozzle part N can be implemented surely and speedy.

[0081] As mentioned above, it is preferable that two pairs of the yarn producing units Ua, Ub are built in the spinning member P and the compressed air is jetted from the compressed air supply source to the air jet nozzle 21 of two pairs of the yarn producing units Ua, Ub through the shell 27 forming the compressed air passage 26 at the same time in restarting the spinning. Therefore, in an embodiment of the present invention, it is comprised such that pipes 68a, 68b connecting to the shells 27a, 27b are connected to one main pipe 69 in the way and the jet of the compressed air from the air jet nozzle 21 of two pairs of the yarn producing units Ua, Ub is implemented at the same time by the common switching means like an electro-solenoid valve 70 installed in the way of the main pipe 69 (see Figure 10).

[0082] Likewise, as it is preferable that the compressed air is jetted from the assistant nozzles 33 of the respective hollow guide shafts 28 of two pairs of the yarn producing units Ua, Ub at the same time in restarting the spinning, it is comprised that the pipes 36a, 36b connected to the barrel part 31 of each hollow guide shaft 28 through the connecting tool 35 are connected to one main part 71 in the way and the jet of the compressed air from the assistant nozzle 33 of two pairs of the yarn producing units Ua, Ub is implemented at the same time by the common switching means like the electro-solenoid valve 72 installed in the way of the main pipe 71 (see Figure 4).

[0083] As mentioned above, each inserting hole 53 formed in the first swinging arm 24 is respectively connected to each spinning room 20 and the wall (the shield wall) dividing among each inserting hole 53 is provided in the first swinging arm 24. In the first swinging arm 24, each inserting hole 53 is open to outside respectively, but a plurality of the installing blocks 37 of the hollow guide shaft 28 is surely fitted into each inserting hole 53 respectively and each spinning room 20 is completely shielded by the core adjusting work and the presswork of the coil spring 51, so that the revolving airflows in each spinning room 20 do not interfere with each other, and the quality deterioration of the single yarns Ya, Yb by the interference of the revolving airflow can be prevented.

[0084] According to the present invention mentioned above, the spinning that cannot be realized in the conventional doubled yarn spinning device can be implemented even in the case that the fiber bundle 1 is 100% short-fibered cotton, and the high speed spinning more than 300 meter/minute can be also implemented, for example.

[0085] Due to the arrangement as described above, the present invention demonstrates the following advantages.

[0086] As the spinning member is comprised of arranging a plurality of the yarn producing units having the hollow guide shaft formed in the yarn passage extended to the axis direction and the air jet nozzle generating the revolving airflow in the spinning room in the tip of the hollow guide shaft, and the doubled-yarn guide is equipped between the spinning member and the winding part and the single yarns produced in a plurality of the yarn producing units are united in the doubled-yarn guide, the single yarn produced in the spinning member does not balloon between the spinning member and the doubled-yarn guide, so that, like the conventional spinning device, the trouble like the yarn breakage by ballooning is not generated and the quality of the doubled yarn is not deteriorated.

Claims

1. A spinning device, **characterized in** having a drafting device which drafts a fiber bundle, a spinning member positioned in the downstream side of the drafting device and a winding unit which winds a spun yarn produced by a spinning member, wherein the spinning member is comprised by arranging a plurality of yarn producing units having a hollow guide shaft that a yarn passage extended to the axis direction is formed and an air jet nozzle which generates a revolving airflow in a spinning room which is in a tip part of the hollow guide shaft, and a doubled-yarn guide is provided between the spinning member and the winding part, and single yarns produced by a plurality of yarn producing units are united in the doubled-yarn guide and are wound to a winding package as the doubled yarn in the winding part.

2. A spinning device according to Claim 1, wherein each yarn producing unit has a suction-power generating means respectively which generates a suction power from a yarn passage inlet to a yarn discharging outlet of the hollow guide shaft, and the spun yarn is discharged from each yarn producing

unit by working both an air jet nozzle and the suction-power generating means in the yarn discharging spinning at the beginning of the spinning, and a control device which switches to the normal spinning by stopping the operation of the suction-power generating means with keeping the operation of the air jet nozzle at the end of the yarn discharging spinning is provided.

3. A spinning device according to Claim 2, wherein the suction-power generating means has an inner air passage formed in the outer side of the yarn passage in the hollow guide shaft and an assistance nozzle connecting the inner air passage and the yarn passage, and jets the compressed air from the inner air passage into the yarn passage through the assistance nozzle.

4. A spinning device according to Claim 2 or Claim 3, wherein the jet pressure of the air jet nozzle can be changeable, and the control device keeps the jet pressure of the air jet nozzle low in the prescribed time from the beginning of the yarn discharging spinning.

5. A spinning device according to any one of Claims 2～ 4, having a yarn piecing part, a spinning-side yarn end guide means that the spinning-side yarn end discharged from the yarn producing unit by the yarn discharging spinning is led to the yarn piecing part and a winding-side yarn end guide means that the winding-side yarn end unwinded from the winding package is led to the yarn piecing part, wherein the yarn piecing process of the spinning-side yarn end and the winding-side yarn end is carried out by working the spinning-side yarn end guide means and the winding-side yarn end guide means in yarn piecing operation, and in yarn piecing operation the spun yarn produced by the yarn discharging spinning is all eliminated and the spun yarn after switching to the normal spinning is pieced.

6. A spinning device, having a drafting device which drafts a fiber bundle, a spinning member positioned in the downstream side of the drafting device and a winding part which winds a spun yarn produced by the spinning member, **characterized in that** the spinning member is comprised by arranging a plurality of the yarn producing units having a hollow guide shaft part and a spinning nozzle part, and the hollow guide shaft part has a hollow guide shaft formed a yarn passage extended to the axis direction, and the spinning nozzle part has an air jet nozzle that generates the revolving airflow in a spinning room in the tip part of the hollow guide shaft, and a plurality of the hollow guide shaft parts and a plurality of the spinning nozzle parts is comprised of being able to contact or no contact by a common drive means, and a doubled-yarn guide is provided between the spinning member and the winding part, and the single yarns produced by a plurality of the yarn producing units are united in the doubled-yarn guide and winds to a winding package as a doubled yarn in the winding part.

7. A spinning device according to Claim 6, having a shield part which shields the spinning room in each yarn producing unit each other, is comprised that the revolving airflow in each spinning room does not interfere with each other in spinning.

8. A spinning device according to Claim 6 or Claim 7, equipped with the first arm installing a plurality of the spinning nozzle parts and having a plurality of the inserting holes corresponded to each spinning nozzle part and the second arm installing a plurality of the installing blocks and comprised freely contacting to the first arm, wherein the hollow guide shaft is installed in a plurality of the installing blocks respectively and a part of a plurality of the installing blocks installed in the second arm is inserted into a plurality of the inserting holes formed in the first arm respectively and the positioning of the hollow guide shaft to the air jet nozzle is carried out.

9. A spinning device according to Claim 8, wherein a plurality of the installing blocks is supported to the second arm through a elastic body in order to separately adjust the core freely, and as a part of the installing block is inserted into the inserting hole in approaching both arms, each installing block is comprised of separately adjusting the core to each inserting hole and of pressuring the installing block to the spinning nozzle part by the energization power of the aforementioned elastic body.

FIG. 1

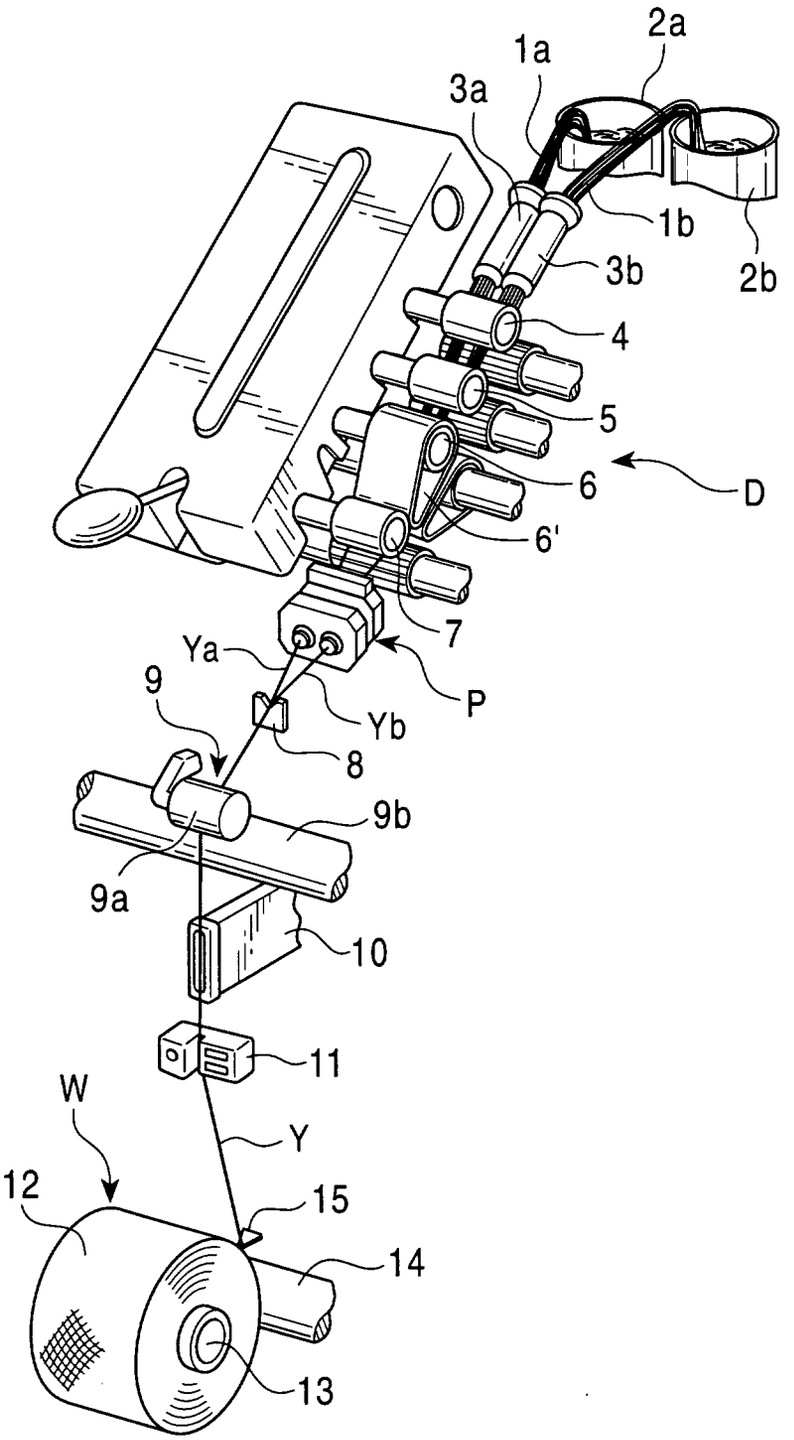

FIG. 2

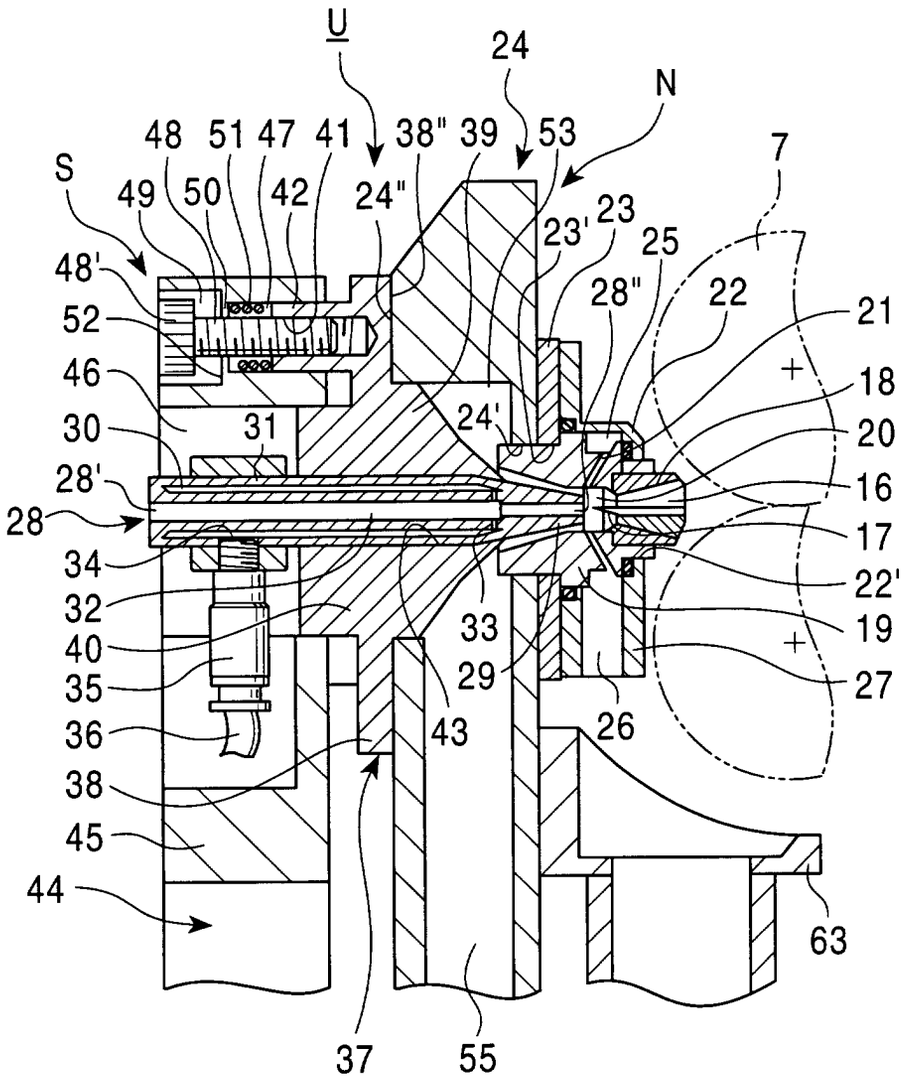
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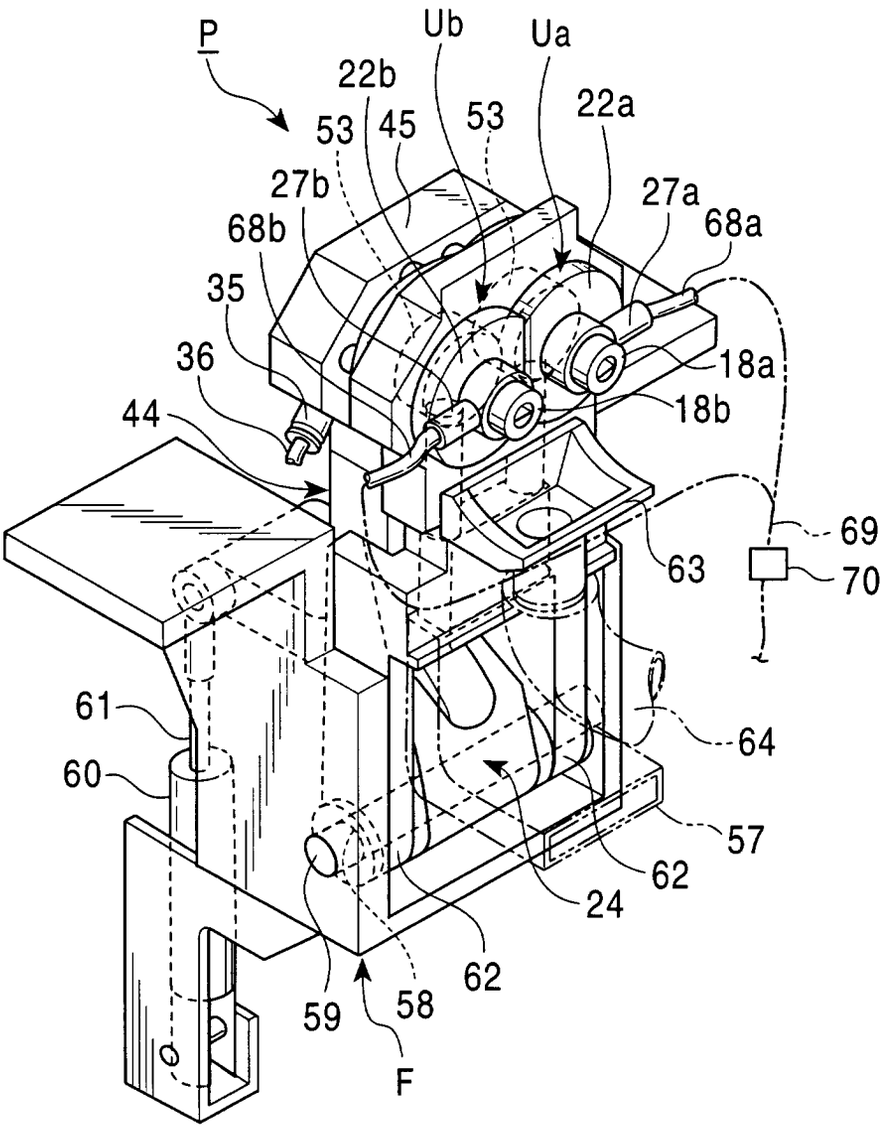
FIG. 3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36
18a
18b
44
69
63
70
61
64
60
57
62
24
62
59
58
F

FIG. 4

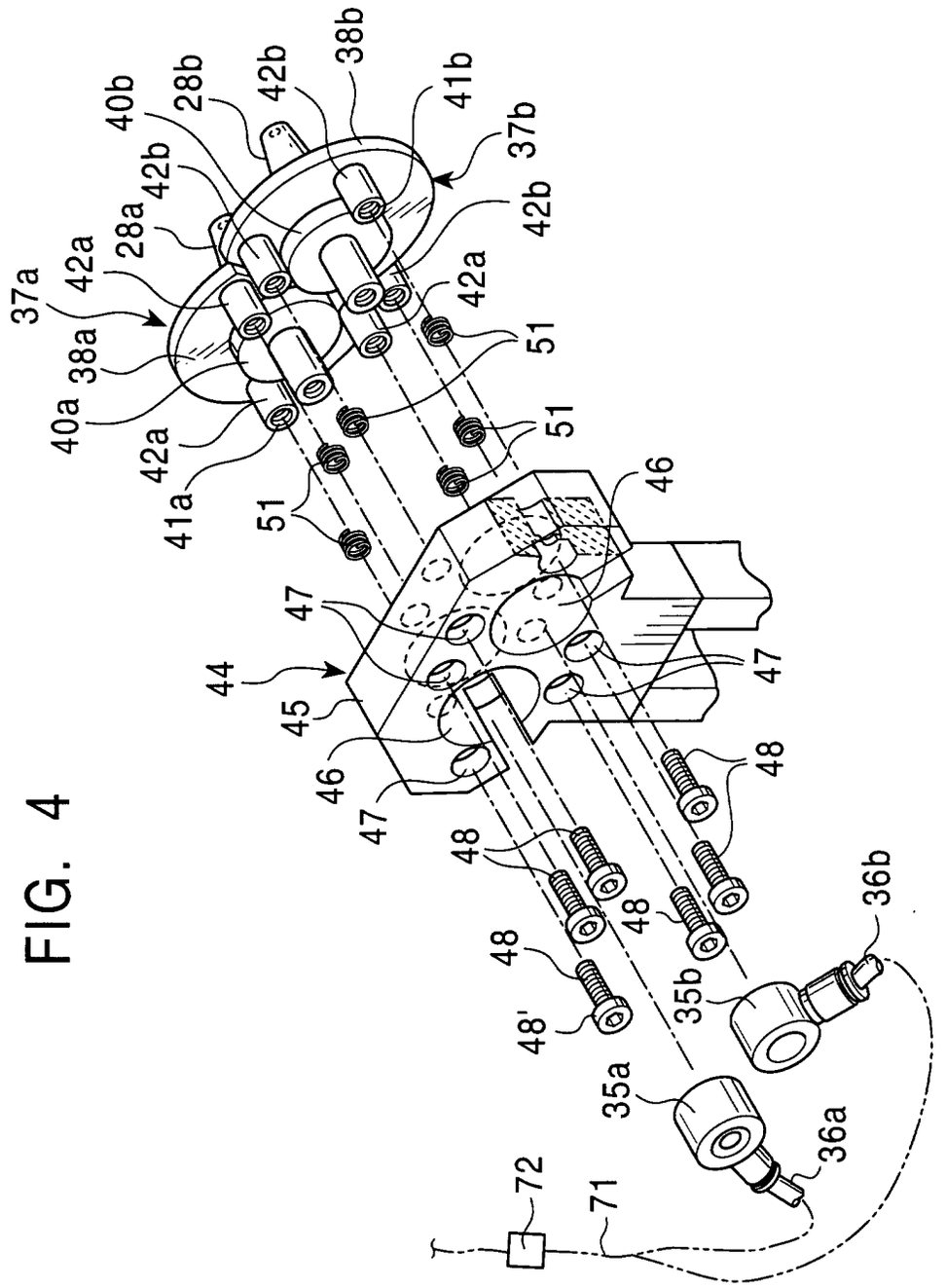

37a
42a
28a
42b
40b
28b
42b
38b
41b
37b
42b
38a
40a
42a
42a
51
41a
51
51
51
46
47
44
47
45
46
47
48
48
48
48
48'
36b
35b
35a
36a
72
71

FIG. 5

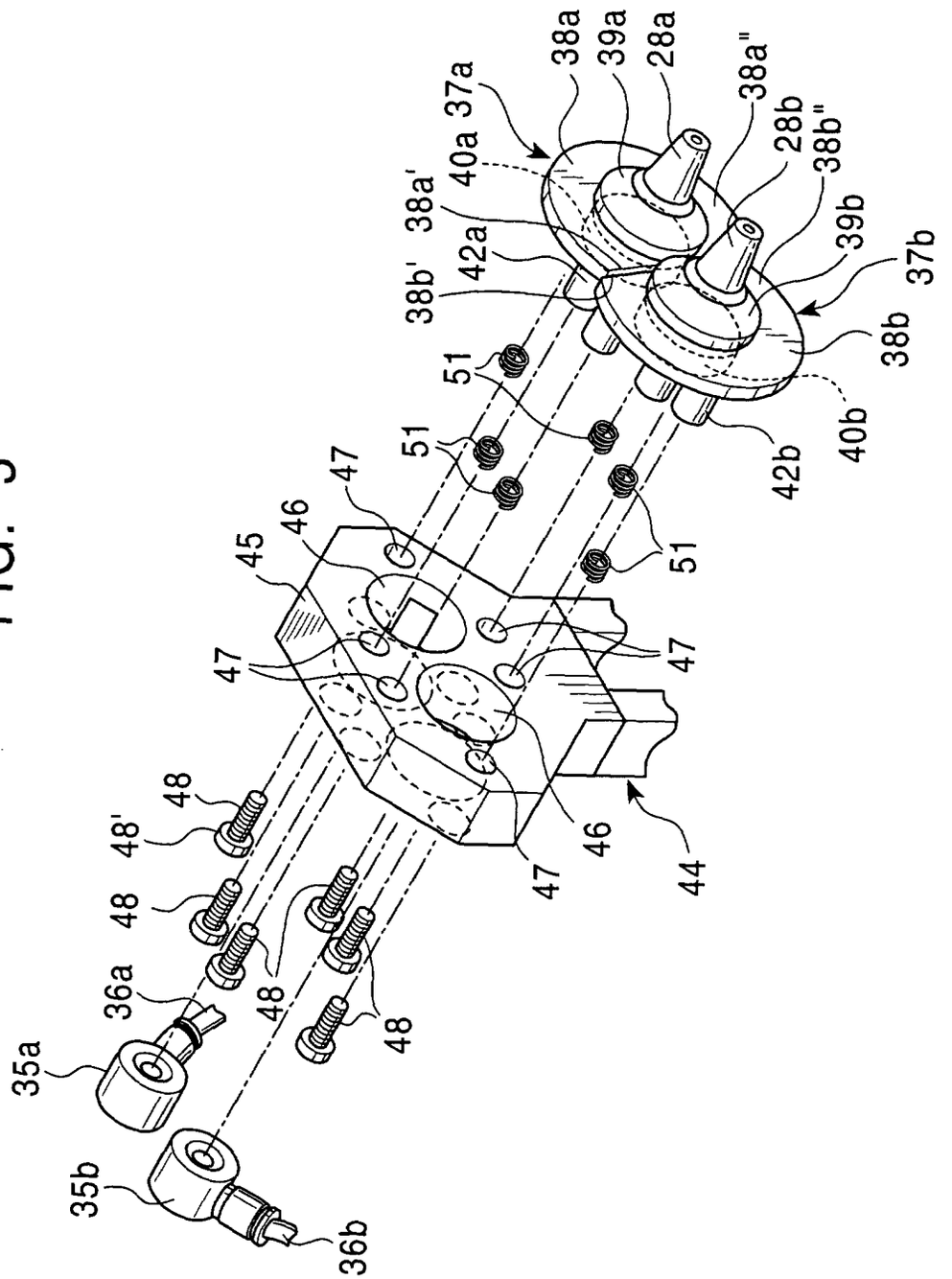

38a
39a
28a
38a"
37a
40a
28b
38b"
38a'
39b
38b'
42a
37b
38b
51
40b
42b
47
46
45
44
48
48'
36a
35a
35b
36b

FIG. 6

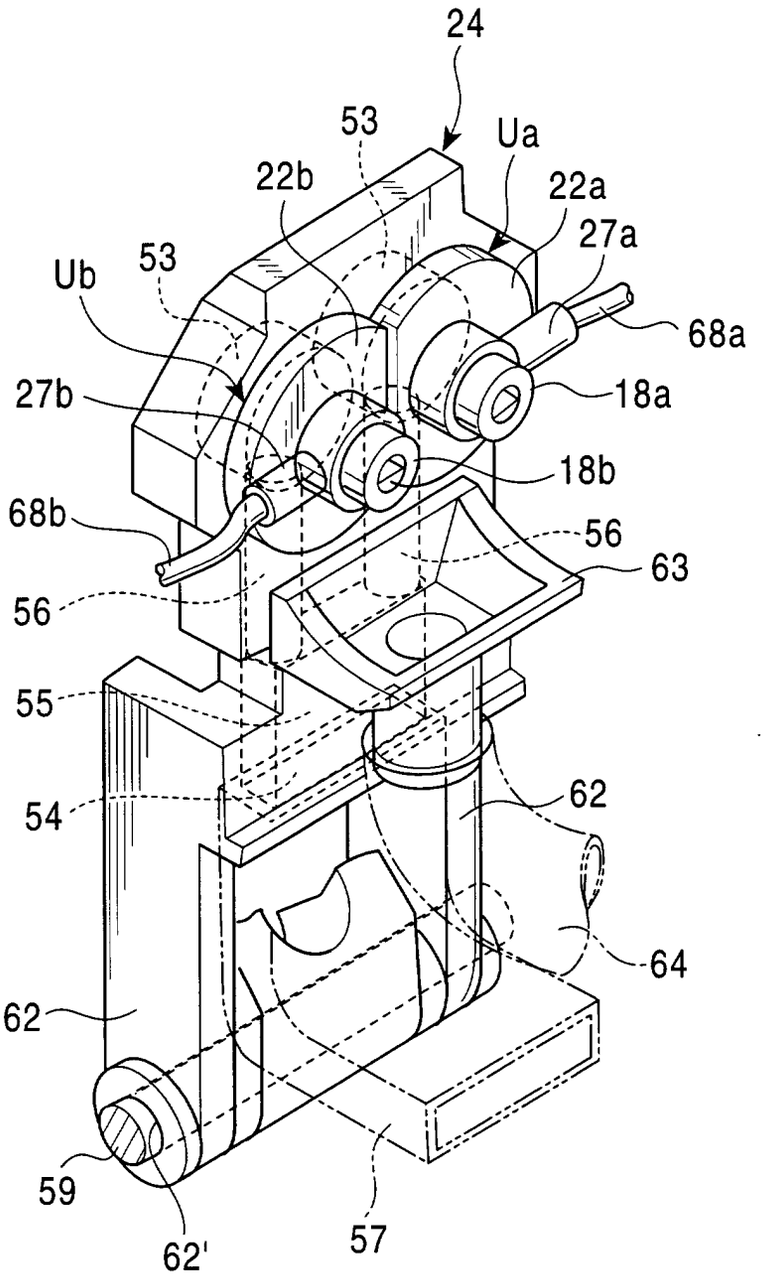

24
53
Ua
22b
22a
27a
Ub
53
68a
27b
18a
18b
68b
56
63
56
55
62
54
64
62
59
57
62'

FIG. 7

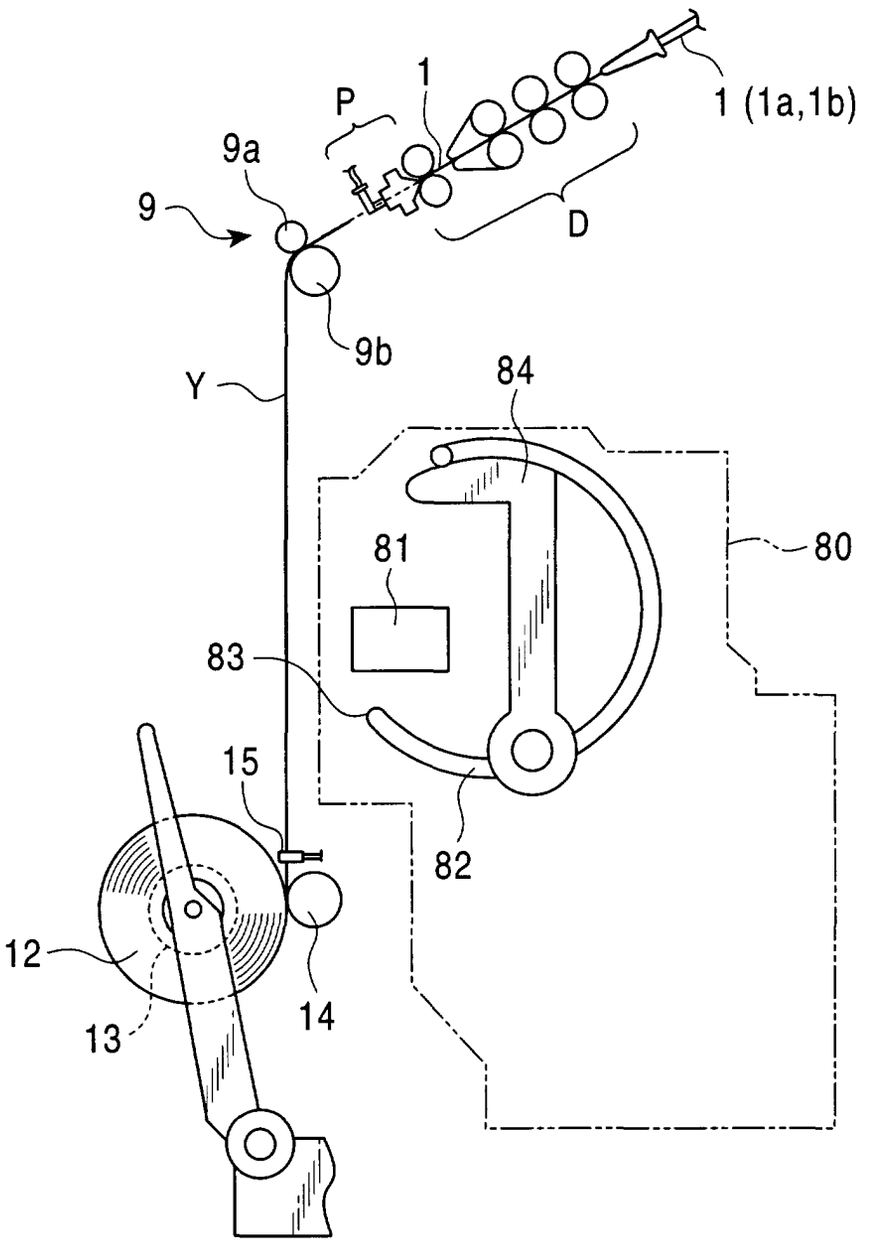


FIG. 8

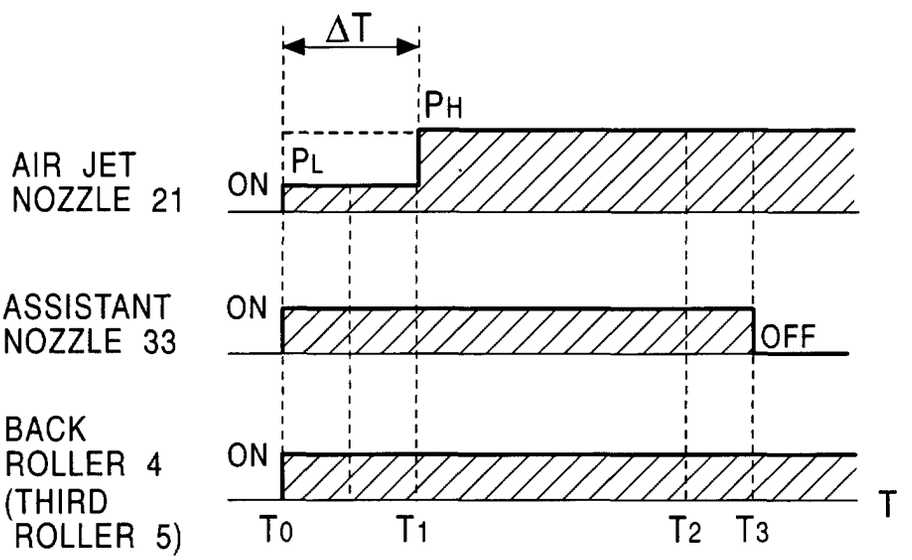

ΔT
PH
PL
AIR JET NOZZLE 21
ON
ASSISTANT NOZZLE 33
ON
OFF
BACK ROLLER 4 (THIRD ROLLER 5)
ON
T
T0
T1
T2
T3

FIG. 9

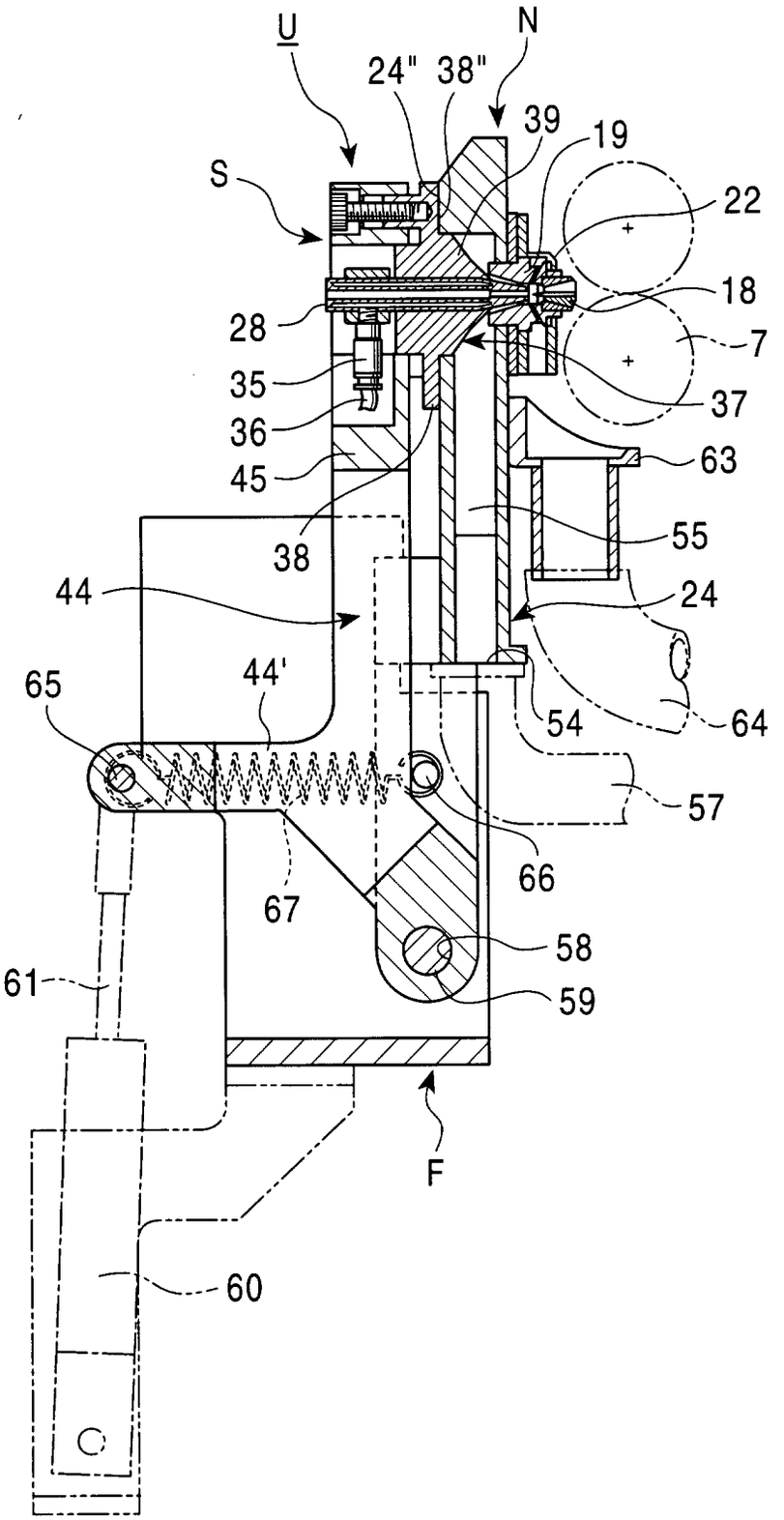

U
N
24"
38"
39
19
S
22
18
28
7
35
37
36
63
45
55
38
44
24
65
44'
64
54
57
66
67
58
61
59
F
60
C

FIG. 10

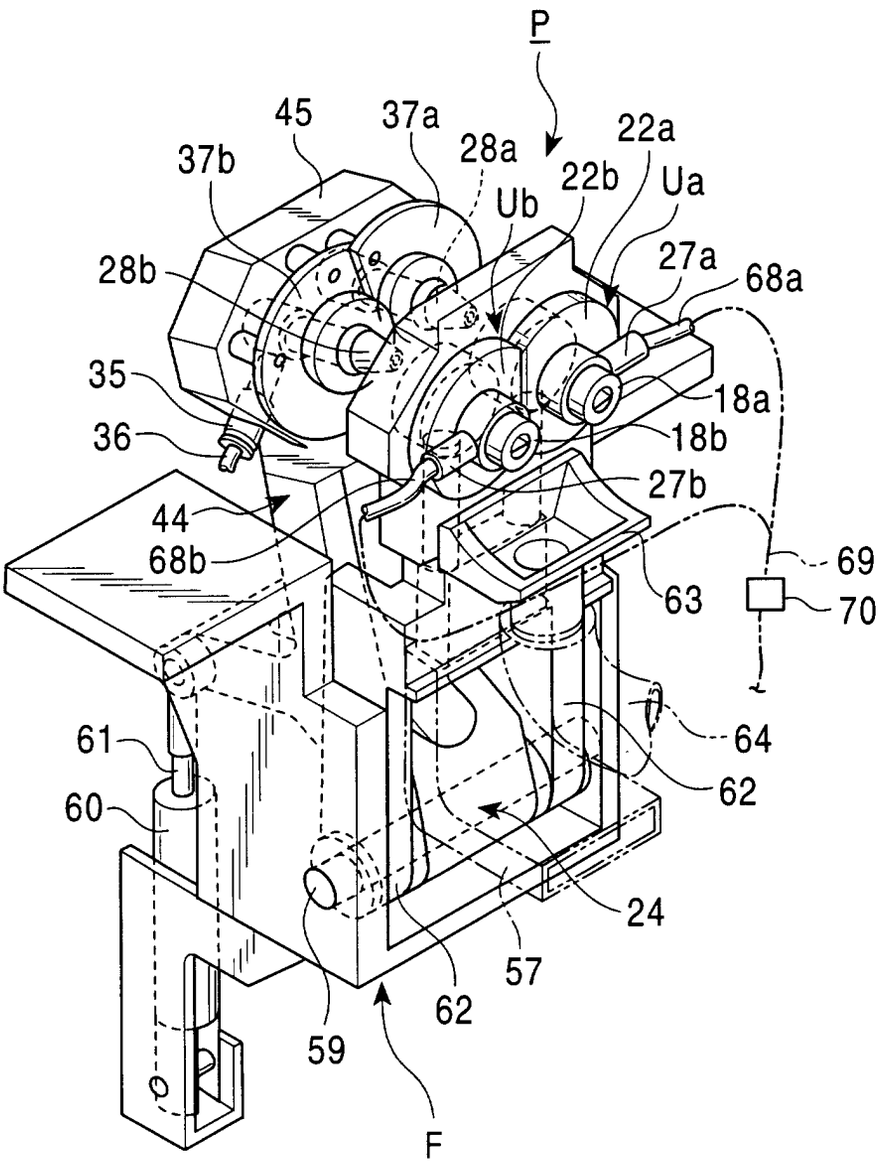

P
45
37a
28a
22a
37b
22b
Ua
Ub
28b
27a
68a
35
18a
36
18b
27b
44
68b
69
63
70
61
64
60
62
24
57
62
59
F

FIG. 11

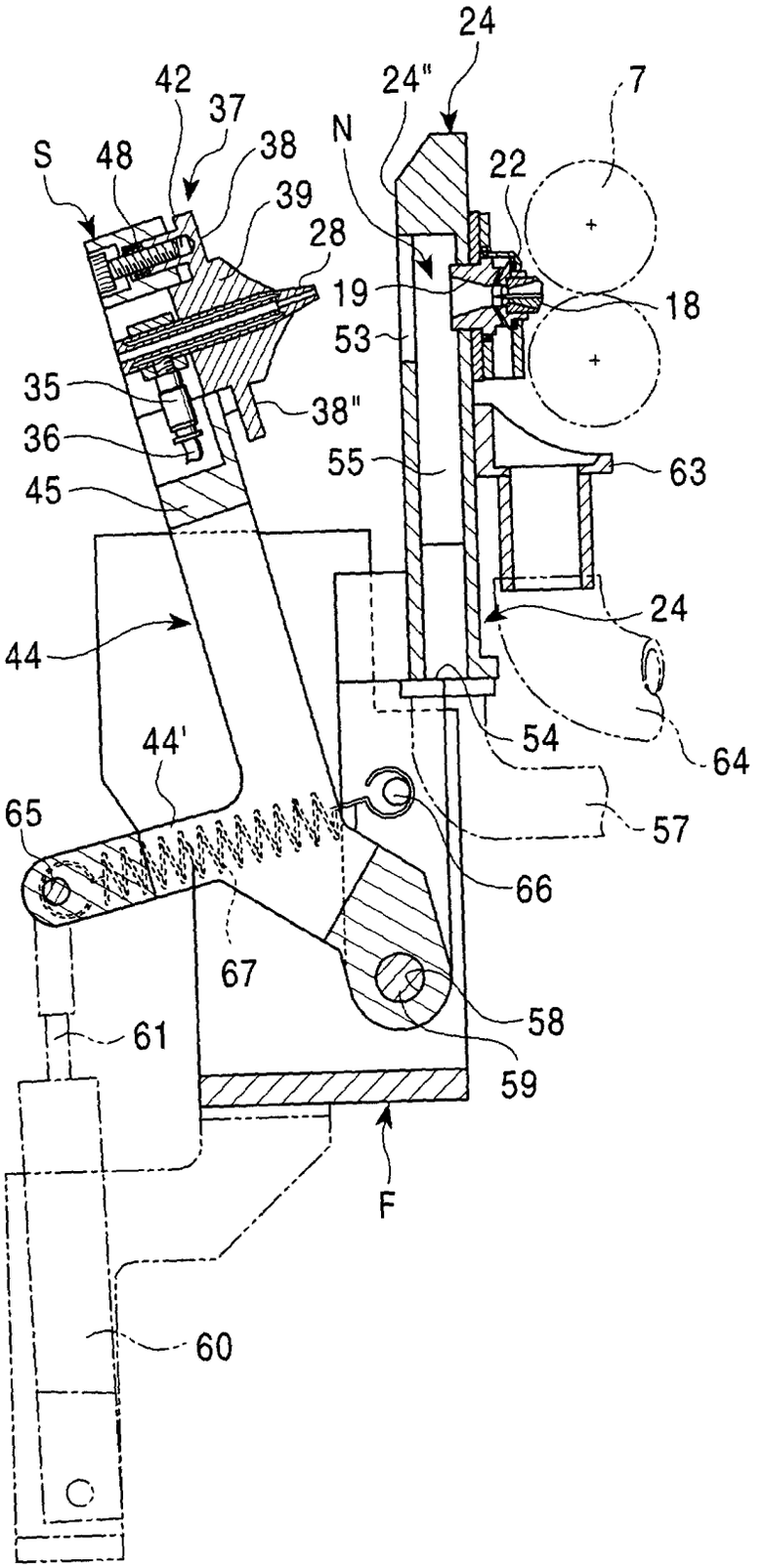
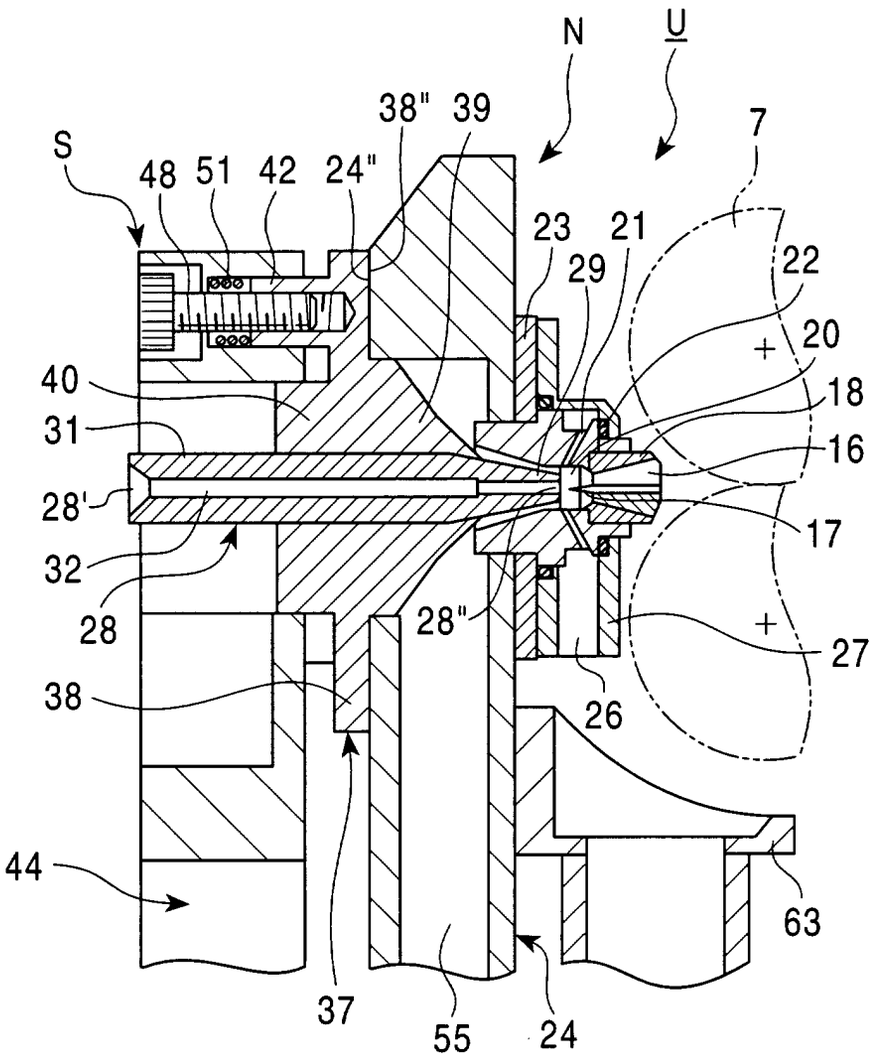

24
42
37
24"
7
S
48
38
N
22
39
28
19
18
53
35
38"
36
55
63
45
24
44
54
64
44'
65
57
66
67
58
61
59
F
60

FIG. 12


N
U
38"
39
7
S
48
51
42
24"
23
21
29
22
20
40
18
31
16
28'
17
32
28
28"
27
38
26
44
63
37
55
24